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Westerman et al.(10) **Pub. No.: US 2014/0226879 A1**(43) **Pub. Date: Aug. 14, 2014**(54) **FINGERPRINT IMAGING AND QUALITY  
CHARACTERIZATION**(52) **U.S. Cl.**CPC ..... **G06K 9/00013** (2013.01)USPC ..... **382/125**(71) Applicant: **APPLE INC.**, Cupertino, CA (US)(72) Inventors: **Wayne C. Westerman**, Burlingame, CA  
(US); **Karen L. Jenkins**, Mountain  
View, CA (US)

(57)

**ABSTRACT**

A fingerprint processing system comprises a fingerprint sensor configured to generate an image of a fingerprint, and a processor configured to process the fingerprint image. The processor is operable to generate a ridge flow map comprising ridge flow vectors characterizing the fingerprint, and a multi-layer decomposition based on the ridge flow vectors. The decomposition includes at least first and second-order residuals, based on the ridge flow vectors, and the processor is operable to characterize a quality of the fingerprint image, based on the residuals.

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